IN THE SPECIFICATION

Please amend the following paragraphs as follows.

[0005] Referring to FIG. 1A, a substrate 100 is provided. An insulation ~~isolation~~ layer 102 and an amorphous silicon layer 104 are sequentially formed on the substrate 100. A patterned anti-reflective layer 106 comprised of a silicon nitride layer is formed the amorphous silicon layer 104, and thereby defining a non-exposure region 130 (covered by the anti-reflective layer 106) and an exposure region 140 (not covered by the anti-reflective layer 106).

[0009] Referring to FIG. 2A, a substrate 200 is provided. An insulation ~~isolation~~ layer 202 and an amorphous silicon layer 204 are sequentially formed on the substrate 200. A patterned silicon nitride layer 206 is formed on the amorphous silicon layer 204 covering a portion 240a of the amorphous silicon layer 204 defining a non-exposure region 230. A portion 204b not covered by the amorphous silicon layer 204 remain exposed is defined as an exposure region 240. The silicon nitride 206 serves as a heat sink.

[0015] In accordance with the above objects and other advantages, as broadly embodied and described herein, the present invention provides a method of forming polysilicon film comprising the steps of: forming an amorphous silicon layer on a substrate; forming a first optical layer on the amorphous silicon layer, wherein the first optical layer is comprised of a first region with a first thickness and a second region

with a second thickness, and a reflectivity of the first region is higher than a reflectivity of the second region; performing a laser annealing process wherein a temperature of the amorphous silicon layer beneath the first region is lower than that of the amorphous silicon layer beneath the second region so that the amorphous silicon layer beneath the first region is partially or not completely melted and the amorphous silicon layer beneath the second region is substantially or completely melted; and crystallizing the melted silicon layer. Because of the differential lateral temperature gradient, the melted amorphous silicon layer can laterally crystallize by using the partially or incompletely melted amorphous silicon layer as a nucleation site/discrete seed to form a polysilicon film.

[0016] According to one aspect of the present invention, an optical layer having differential thickness ~~having~~ with differential reflectivity is formed on an amorphous silicon layer so that the corresponding portions of the amorphous silicon layer can be subjected to differential annealing temperatures to induce lateral crystallization of the amorphous silicon layer.

[0017] Further, the physical profile, such as thickness, can be accordingly tailored to provide desired degree of light reflectivity to achieve desired lateral differential temperature gradient. Therefore, the method of the present invention is capable of precisely controlling the lateral differential temperature gradient between prescribed regions of the amorphous silicon layer in order to induce crystallization of amorphous silicon layer at specific locations and to increase the silicon grain size.

Therefore, a polysilicon film comprising a uniform and larger silicon grains in prescribed regions can be formed.

[0026] Referring to FIG. 3A, a substrate 300 is provided. The substrate 300 is comprised of, for example, a silicon wafer, a glass substrate or a plastic substrate. An insulation ~~isolation~~ layer 302 is formed on the substrate 300. Preferably, the material of the insulation ~~isolation~~ layer 302 is comprised of, for example, silicon dioxide, and can be formed by performing, for example, a low pressure chemical vapor deposition (LPCVD) process, a plasma enhanced chemical vapor deposition (PECVD) process or a sputtering process. The insulation ~~isolation~~ layer has a thickness of, for example, about 500~4000Å. An amorphous silicon layer 304 is then formed on the insulation ~~isolation~~ layer 302, and the amorphous silicon layer 304 can be formed by performing, for example, a LPCVD, a PECVD or a sputtering process. The amorphous silicon layer 304 has a thickness of, for example, about 200~3000Å.

[0031] During the laser annealing process 308, the ~~optical~~ anti-reflective layer 306a in the heat sink region 430 and the ~~optical~~ heat sink layer 306b in the anti-reflective region 440 are formed with ~~differential~~ different thickness on the amorphous silicon layer 304, and therefore a differential temperature ~~difference~~ gradient exists between the amorphous silicon layer 304a beneath the anti-reflective region 440 and the amorphous silicon layer 304b beneath the heat sink region 430 to induce lateral crystallization of the amorphous silicon layer 304. It is to be noted that the degree of the differential temperature ~~difference~~ gradient can be controlled by tailoring the thickness of ~~optical layers~~ anti-reflective layer 306a and the heat sink layer 306b to

achieve desired lateral crystallization of the amorphous silicon layer 304 to form a polysilicon film.

[0032] Finally, as shown in FIG. 3E, the amorphous silicon layer is transformed into a polysilicon films 312a and 312b through lateral crystallization of the amorphous silicon layers 304a and 304b, wherein the un-melted portion of the amorphous silicon layer 304b serves as a nucleation site/discrete seed. The arrow 310 represents the lateral direction of crystallization, wherein the amorphous silicon layer 304a is transformed into the polysilicion film 312a, and the amorphous silicon layer 304b is transformed into the polysilicon film 312b. The polysilicon layer 312a has larger silicon grain size and ~~have~~ has better electrical properties. Accordingly, by controlling the pattern and location of the optical layer 306, polysilicon films comprising silicon grains with desired grain size can be formed at prescribed locations and along the prescribed crystallization directions.

[0035] Moreover, although not mentioned in the preferred embodiment, the present invention also includes forming an optional insulation ~~isolation~~ layer between the substrate 300 and the insulation ~~isolation~~ layer 302, comprised of a material different form that of the insulation ~~isolation~~ layer 302 to serve as a protection layer of the substrate 300.

[0036] Referring to FIG. 5, a temperature gradient distribution curve showing the relationship between the partially or incompletely melted portion of the amorphous silicon layer beneath the heat sink region and the melted portion of the amorphous silicon layer beneath the anti-reflective region. Because the amorphous silicon layer

304b beneath the heat sink layer 306b is only partially melted, a large temperature difference exists between the un-melted portion of the amorphous silicon layer 304b beneath the ~~optical~~ heat sink layer 306b in the heat sink region and the melted portion of the amorphous silicon layer 304a beneath the ~~optical~~ anti-reflective layer 306a in the anti-reflective region. Because of the larger temperature difference as shown in the temperature gradient distribution curve, silicon grains with larger grain size can be generated. Further, the polysilicon film can be formed with silicon grains having uniform grains size and thereby substantially improving device performance of thin film transistors. In addition, the lateral differential temperature gradient of the present invention is larger than that in the conventional method, which utilizes either an anti-reflective layer or a heat sink layer. Therefore, the present invention has the capability of enhancing the lateral crystallization of the polysilicon film generating larger silicon grains.

[0038] Next, referring to FIG. 7, a cross sectional view of a top gate polysilicon thin film transistor of FIG. 6 is shown. As shown in FIG. 6, an insulation ~~isolation~~ layer 328 is formed on the channel layer 324, i.e. polysilicon layer. Then a gate conductive layer 330 is then formed on the insulation ~~isolation~~ layer 328. After forming the gate conductive layer 330, a dielectric layer 332 is formed over the gate conductive layer 330, fully covering resulting structure including the substrate 300. Finally, source/drain regions, i.e. doped polysilicon layer 326, and contact windows 334 are formed. Thus, the fabrication of a thin film transistor is completed.

[0039] As described above, because the present invention provides an optical layer having differential thickness having differential reflectivity formed on an amorphous silicon layer so that the corresponding portions of the amorphous silicon layer can be subjected to differential annealing temperature to induce crystallization of the amorphous silicon layer. Further, the physical profile, such as thickness, can be accordingly tailored to provide desired degree of light reflectivity to achieve desired lateral differential temperature gradient. Therefore, the method of the present invention is capable of precisely controlling the lateral differential temperature gradient between prescribed regions of the amorphous silicon layer in order to induce crystallization of amorphous silicon layer at specific locations and to increase the silicon grain size. Therefore, a polysilicon film comprising a uniform and larger silicon grains in prescribed regions can be formed. Therefore the electrical property of the polysilicon film formed by using the method of the present invention can be substantially promoted.